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ALASKA.

BY

OTTO J. KLOTZ,

OF THE ALASKA BOUNDARY SURVEY.

1894

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By OTTO J. KLOTZ, D.T.S.

(Of the Alaska Boundary Survey).

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It was not many years after the discovery of the eastern coast of America that the South Sea or Pacific Ocean was seen by Balboa from the heights of Darien. Balboa was the first European to place foot on the western coast of America.

Sir Francis Drake, the celebrated English admiral, was the first to explore the western coast northward, as far as latitude 48° , *i.e.*, north of the mouth of the Columbia River.

Having landed, he named the country New Albion, and took possession of it in the name of Queen Elizabeth; this was in 1578. The object of his exploration was to find a passage to the north Atlantic.

For the next 150 years no discoveries of importance were made on the west coast of North America.

Hitherto all discoveries in America, both on the east and west coasts, had been made by expeditions crossing the Atlantic westward, but in 1741 Vitus Bering, the intrepid Russian explorer, discovered the continent in latitude 58° , by sailing eastward from Kamtchatka. That part of the continent where Bering landed is now known as Alaska,—the subject of our discourse.

The principal motive of all the expeditions up to this time was not for the increase of geographical knowledge, but for material wealth; legitimately obtained we call it commerce, otherwise conquest.

The Spanish, after Columbus, set out to discover and obtain the silver of Mexico and Peru; and Sir Francis Drake, to discover the Spanish galleons—and he found them. The Russians were after fur, and geography was benefitted by the discovery of the Aleutian and Kurile Islands, the north-west coast and Bering Strait.

The next explorer of note on this part of the continent was the celebrated navigator, James Cook. As a navigator the merits of Captain

Cook are of the highest order. He made many discoveries in the South Sea, and added greatly to Britain's possessions. In 1778, after leaving the Sandwich Islands, which he discovered, he reached the west coast of the continent, which he followed northward in the hope of finding a passage to the Atlantic. He penetrated as far as the bay now known as Cook's Inlet in Alaska, but of course failed in the object of his search. At Bering Strait he was repelled by the impenetrable wall of ice. Returning to the Sandwich Islands to winter there, he met a sad death at the hands of the natives.

We now come to the last and most important explorer, from a geographical point of view, that laboured along the north-west coast of the continent,—George Vancouver.

As an accurate geographer I place Vancouver above anyone previous or subsequent to his time, considering the extent of coast and shore-line covered, and the time taken for executing the same. It is now a hundred years since Vancouver made his survey; look at the most recent charts extending from California to Cook's Inlet—1,500 miles in latitude—and thousands of miles of coast-line, and what do we find new—minor details—the groundwork is as prominent to-day as a century ago. To one familiar with Vancouver's work and the intricate British Columbian and Alaskan coast, the former must ever be an object of the highest admiration.

Vancouver was with Captain Cook when the latter visited the American continent. After Cook's death Vancouver was given the command of an expedition to the north-west coast of America, the object being to take over from the Spaniards their territory in that region, and to explore the coast from 30° north latitude to Cook's Inlet with a view to the discovery of an eastward passage to the Great Lakes in the British dominions.

Vancouver was then only 33 years of age. He spent the seasons of 1792, 1793 and 1794 in surveying the coast, wintering in the Sandwich Islands. He died when he was but forty, and before he had quite finished the narrative of his work. His zeal led him to take an active share in all operations, and the hardships he thus suffered tended, no doubt, to shorten his life. He was a man of great tact, humanity, generosity, and uprightness of character.

The man who finally established the Russian Empire on the North American continent was the iron-willed Baranov, and the extension of the Muscovite's dominions was due to the value of the fur trade,—sea otters and seals.

In 1797, the various trading companies of Eastern Siberia and the American colonies were consolidated with the Russian American Company, which, in 1799, obtained a charter from the Imperial Government, granting it exclusive rights in the new Russian possessions. This charter marks an epoch in the history of Alaska, which from that time until the transfer of the country to the United States became identical with that of the Russian American Company.

In 1811, the Russians established themselves on the coast of California, the object being to prosecute agriculture and thereby make California the source of supply for provisions, but in this respect the enterprise proved a failure; for the Siberians and Aleuts, who were placed there, were but very indifferent farmers. Between the Stikine and Bodega Bay in California the Russians never had an establishment.

In 1774-75 the Spanish navigators, Perez and Quadra, made some explorations on the west coast, and later Captains Meares, Portlock and Dixon.

We will now turn our attention to the physical features of the country. The word Alaska, or Aliaska, was first applied to the narrow peninsula of the north-western most part of the North American continent, and extending into the Pacific to where the chain of the Aleutian islands begins. Now, the word Alaska is used to designate the vast territory lying between the Arctic and the Pacific and west of the 141st meridian, together with a narrow strip along the coast extending southward to Portland Canal, and including the adjacent and Aleutian islands. The coast of Alaska, washed by the Pacific, sweeps northward and westward from Dixon Entrance in a mighty curve, measuring over 1,200 miles, to the western extremity of the Alaskan peninsula; and from here again the Aleutian chain of islands stretches, far towards the coast of Asia, in another long curve of nearly 1,000 miles. The most southerly part of the latter curve is in latitude $51^{\circ} 30'$, that is, about the latitude of London, England. The most northerly part of Alaska is at Point

Barrow in the Arctic Ocean. The area of land comprised within the limits of Alaska has been estimated at 531,000 square miles, one-sixth of the total area of the United States.

The south-eastern part of Alaska, the narrow strip already mentioned, and which at the present time most interests us on account of its undefined boundary, is shielded from the open sea by a vast archipelago of islands, large and small, 1,100 in round numbers, most of these being mountainous throughout, and all covered with a dense growth of spruce, hemlock and cedar.

The islands vary in size from 125 miles in length to mere definitions. Beside the channels, straits, bays, inlets and canals found here, the fiords of Norway and scheres of Finland sink into insignificance.

As we proceed northwesterly along the coast, the mountains increase in height culminating in the lofty St. Elias on or near the international boundary. His foot is laved by the Pacific, while his snowy head is wrapped in clouds. Mont Blanc, the giant of European mountains, would need a pedestal 3,000 feet high to bring it to the height of our international landmark.

The highly mountainous character of the coast line continues to the extremity of the Alaskan peninsula.

On rounding the peninsula and following the shore line, a total change of the aspect of the coast can be observed. Low, sandy reaches and slightly elevated moorland cover the wide interval between the mountains and the shores of Bering Sea. Similar it is along the Arctic Ocean with occasional rocky spurs and steep cliffs.

The great highway of the interior of Alaska is the Yukon, one of the large rivers of the world. In some parts of its course, through the tundra regions, it is several miles in width. Its vast unsurveyed deltoid mouth makes navigation, with anything but light-draught vessels, impossible.

The length of coast line of Alaska's mainland and islands is nearly four times that of all other parts of the United States combined, being over 26,000 miles, while that of the rest of the United States, from Maine to California, is only about 7,000 miles.

The climate of the Alaskan coast regions is much milder, even in

the higher latitudes, than it is in the interior, or in corresponding latitudes on the Atlantic coast ; this is easily explained and understood when the natural forces productive of this milder temperature are contemplated. The most important among them is a thermal current resembling the Gulf Stream in the Atlantic. This current, known as the Japanese or Kuro Siwo, has its origin under the equator near the Molucca and Philippine Islands, passes northward along the coast of Japan, and crosses the Pacific to the southward of the Aleutian Islands, after throwing a branch through Bering Sea, in the direction of Bering Straits. The main current strikes the Queen Charlotte Islands, where it divides, one branch going south along the coast of British Columbia, while the other turns northward towards Sitka, and thence westward to the Kadiak and Shumagin islands. The comparatively warm waters of these currents affect the temperature of the superjacent atmosphere, which, absorbing the latent heat, carries it to the coast with all its mollifying effects. Thus the oceanic and atmospheric currents combine in mitigating the coast climate of Alaska, and the process is greatly aided by the configuration of the extreme north-western shores of the continent, backed as they are with an almost impenetrable barrier of lofty mountains, which holds back from the interior the warm, moist, atmospheric currents coming in from the ocean, deflecting at the same time the ice-laden northern gales coming from the interior.

The force of these influences as mitigating the coast climate of Alaska becomes evident, when it is stated that the mean winter temperature of Sitka is nine degrees higher than that of Halifax, although Halifax is nearly 900 miles further south than Sitka.

It is obvious that with the presence of these warm, moist, currents, precipitation must be great, and so it is. The greatest rainfall on the continent of America is found on its north-west coast. The maximum recorded annual precipitation is 134 inches, or a little over eleven feet. Here in Ottawa we have about three feet, and think ourselves fairly well supplied at that.

It is not alone the excessive rain that makes the coast of Alaska somewhat undesirable as a place of abode, but the rain that does not come down, the mist and fog. The number of days in a year on which

rain has fallen at Sitka has reached as high as 264. No wonder that some of those who have been in Alaska believe that at man's creation a web-foot was forgotten.

Across the mountains in the interior, both of Alaska and British Columbia, the precipitation is very much less, and the range of temperature very much greater.

On account of the mild climate the snowfall on the coast is not great,—less than we have here.

Among other meteorological phenomena to be noted is the wind. In most localities and regions it is a simple matter to tell in which direction the wind is blowing, but not so on the Alaskan coast. It is something like trying to tell which way water is running in an eddy or whirlpool. Out in the broad ocean the wind has undoubtedly a constant direction, for the time being, but when it approaches the coast, passing through long narrow channels, over mountains, down mountains, around some headland or promontory, buffeted from side to side, its direction is difficult to determine, for in a trice it changes. The severest winds in the summer are the 'south-easters.'

Based upon theory and confirmed by experience, the barometer is, par excellence, the instrument for foretelling the weather, but we must draw the line at Alaska. Everywhere else we pin our faith to the barometer, but here the barometer is impotent; it does nothing to aid, and everything to confuse and distress the sailor and surveyor.

The safest prediction to make is, that it will rain to-morrow, and nine times out of ten you'll be about right.

How one does enjoy a day when the sun shines! The joy is emphasized by the privation.

It is said that the greatest volcanic region in the world lies in the north-west part of the United States, occupying a large tract in Idaho, Washington, Oregon and California. The last eruption in this region is said to have been that of Mount Baker near the British Columbia boundary in 1870. However, Alaska has still several active volcanoes, but none on the mainland, they are in the eastern Aleutian islands.

One of the most notable features of the Alaskan coast is the glaciers. Whenever the annual snowfall on mountains is greatly in excess of

evaporation and of degelation, glaciers must necessarily be formed. Before the glacier is born, we have immense snow-fields or névés. Through accumulation the snow becomes compressed, and this process continues until ice is formed. Ordinarily speaking, ice is a solid, but in reality it is not; in fact, an absolute solid is unknown upon the earth. The behaviour of the ice is like that of a semi-plastic body. When by motion the limit of elasticity in ice is reached and fracture occurs, regelation in a great measure preserves the continuity of the mass. Under the action of gravity and lying on the mountain sides or in depressions, the ice mass flows, and in the same sense as water flows, only of course very much slower. In a river we find the greatest current near the middle, so it is with a glacier. As different rivers have different velocities, depending upon the degree of slope, similarly do we find the rate of flow in glaciers to differ widely, and for like reasons.

Of the living glaciers of south-eastern Alaska, the Muir is the largest and offers probably the best opportunity for measuring the rate of flow. This glacier has an ice front of nearly two miles discharging into the ocean. Its vertical ice-wall at the sea is over 200 feet in height, and its area, including the névé and its ramifications, is approximately one thousand square miles, or greater than the whole of the renowned Swiss glaciers combined.

By the pursuit of the study of astronomy one is led to contemplate the utter material insignificance of man and his terrestrial domicile in the grand macrocosm,—and when one stands on this vast glacier, hears its thundering echoes as it rends and breaks in its seaward journey, as it grinds and scrapes the underlying rocks, as it changes mountains into moraines, which in time become land,—then again is he impressed with the insignificance of man's powers when arrayed against the forces of nature;—then is a new leaf of nature opened to his view, to read its significant characters.

Measurements have been made of the recession of the Muir glacier. From them it appears that within the last few years, its average rate of recession has been nearly a thousand feet per year. The flow or forward motion of the glacier is scarcely appreciable at the sides, but in the centre it is at the rate of about 2,500 feet per year. Prof. Wright

found it, in the summer at central points and near the front, even as high as 65 feet per day. I have stated that the vertical ice wall where the glacier discharges into the sea, is 200 feet above the water, but this is by no means the total thickness of the glacier there. Soundings in the immediate front of the glacier have shown a depth of over seven hundred feet, and, as this is not enough to float a mass of ice rising as high above the water as the Muir glacier, we are forced to conclude that the ice front has a thickness of over nine hundred feet.

A wall of ice nine hundred feet high and nearly two miles long, breasting the element from which it sprang! We are struck with awe. But stop! Let us read more of history—written in characters more indelible than those of man. About fifteen miles south of the present front of the glacier, is Willoughby Island of pure rock, and over a thousand feet high, without the slightest vegetation, and showing a strongly striated surface due to glacial action. That this island was covered by this glacier within recent times is obvious to anyone who has visited the bay and noted the surrounding circumstances.

We have the record of Vancouver too, who, a century ago, passed the mouth of the bay, and reported it one mass of ice.

Hence, had we measured the thickness of the ice only a century ago, where the present ice front is, we should have found it at least 4,000 feet thick instead of 900 as at present. What stupendous change! and all almost within the space of a life. This evidence goes to show that the Muir glacier was at one time, and not long ago, much larger than it now is; but there is evidence too, that it has been much smaller, for on the west side we find a buried forest. Standing trees in situ are found there, which undoubtedly are incontrovertible evidence of a former and greater diminution of the glacier than the present shows.

To give another illustration of the rapid recession of the glaciers at present and during the past, I will quote Sir George Simpson, Governor of the Hudson's Bay Company, who, in 1841, paid a visit to Alaska. When going up Frederick Sound and Stephen's Passage he says:—"The valleys were lined with glaciers down to the water's edge, and the pieces that had broken off during the season filled the canals and straits with fields and masses of ice, through which the vessel could scarcely force her way.

The land on either side displayed to us mountains rising abruptly from the sea, and bearing a glacier in their every ravine. Earlier in the season, these glaciers would have been concealed by the snow, but now they showed a surface of green ice."

The district referred to by Simpson, I frequently visited during the past season, and along Simpson's route there is now not a single glacier reaching tide water. Many of the glaciers of which he speaks have entirely disappeared, and others show their terminals 2,000 feet and upwards from the sea. These are vast changes to occur in a lifetime. There are, however, still four living or tide-water glaciers outside of the great Muir glacier, which discharge ice and small bergs into the sea. Glacier ice differs vastly from Arctic or sea ice. The colour of the former on a face of fresh cleavage is transparent blue of transcendent beauty, impossible to describe. It is very hard and not brittle, and in the sea slowly wastes away. It is dangerous for a vessel to run into glacier ice. Sea water ice is, on the other hand, brittle, and readily crumbles under compact, and is subject to very rapid decomposition. To illustrate the latter, Prof. Elliott mentions that on the 27th of May 1873, the ice fields still surrounded the island of St. Paul in an unbroken mass, as they had done for the preceding five months. The following morning nearly the whole mass had disappeared. As he says, "the decomposition of the ice had taken place so secretly that its final relegation to its original form was fairly accomplished almost instantly and simultaneously, and without warning to human eye; the alternate layering of salt, in ocean water ice, accounts for this peculiar vanishing of sea floes."

That the discharge of glaciers must to some extent affect the temperature of the neighbouring sea, is obvious. During the past season I took a series of temperature readings of the sea as well as of the atmosphere. The mean temperature of the sea along the coast was found to be about 49° F., while the coldest part was found in Endicott Arm, into which the Dawe's glacier discharges,—there the water registered 36° F., a temperature of water in which a misfortune with a boat or canoe would be equivalent to certain death. A marked difference is found even at the same place. The difference is produced

by the tides. When the tide is flooding we have the broad waters of the Pacific rolling towards the coast ; but at ebb tide the cold glacier waters from the shore run out and on the top, being lighter, and hence we find a diminution in temperature of about seven degrees F. From the observations it would appear that the mean summer temperature of the ocean outside of the immediate coast of south-eastern Alaska is about 54° F., which is that of the atmosphere too.

The resources of Alaska are—in order of value,—furs, fish, minerals and timber.

Among furs the seal fur stands vastly pre-eminent.

Our first knowledge of the seal dates back some two hundred years, when in 1684 William Dampier, the privateer, in his voyage round the world, visited the island of Juan Fernandez, of Robinson Crusoe fame, in the South Pacific, and there saw thousands upon thousands of the fur seal.

It appears, however, that a hundred years elapsed ere the fur became a prized article of commerce. Amongst other places in the South Sea in which formerly the fur seal abounded, may be mentioned Masafuera, the South Shetland, Falkland and Georgian islands.

Greed, improvidence and indiscriminate slaughter of old and young, male and female, in a comparatively few years brought about the inevitable, almost annihilation of the seal herds in the South Pacific. In two short years, 1821 and 1822, 320,000 seals were taken from the South Shetland islands alone. They killed all and spared none. The Falkland islands were the rendezvous of a large sealing fleet for a period of nearly thirty years,—1800 to 1826 inclusive, and during this period the whole Antarctic sealing ground was ravaged by the fur-sealers.

While British and American sealers were scouring the South Seas, the seal industry began to gain an importance in quite another quarter of the globe—the Pribilof islands in Alaska. Let us dwell for a moment on the history of the discovery of these valuable islands. The Russians, in their search for fur and new fields, reached the shores of Kamtchatka at the close of the seventeenth century, and there, for the first time, beheld the beautiful and costly fur of the sea-otter. The animal bearing this pelage then abounded on the coast, but by the

middle of the eighteenth century had been almost extirpated therefrom. However, the discovery of Bering island and the Aleutian chain furnished fresh fields for the capture of this valuable animal. But alas, the ravages of man were greater than nature's production, and towards the latter part of the last century the sea-otter gatherers found their occupation almost gone, and hence were obliged to turn their attention in another direction. Up to this time the fur seal, although noted, had not been much valued. Now, however, the Russians became interested in this animal. It had long been noticed by them as well as by the natives that the seal proceeded north through the chain of the Aleutian islands in the early summer and south again in the fall. Where they spent the summer and where they bred, was a profound mystery. It was only after eighteen years of unremitting search by hardy navigators that the El Dorado, the fog-bound Pribilof islands, was found, and by the man after whom the islands are named. This was in 1786. The difficulty of finding this place does not now seem strange, when we understand the currents, the winds and fogs of these waters. The Pribilof islands,—St. George and St. Paul,—lie in the heart of Bering Sea, and are among the most insignificant landmarks known in that ocean, and being almost incessantly surrounded by fog, afforded the fur seal the happiest shelter and isolation. During the year immediately succeeding the discovery of the islands, over 500,000 fur-seals were killed by the Russian hunters. It was obvious that such indiscriminate slaughtering could not continue indefinitely, and government control became necessary. As already stated, the outcome was the formation of the Russian-American Company in 1797, which held absolute sway in Alaska, practically until the cession of the territory to the United States in 1867.

The impetus to the seal-fur trade was given by the Chinese, who were the principal customers of the Russians. Kiachta, a town in the interior and on the Chinese frontier, was the great centre of trade between China and Russia, and thither the furs made a two-thousand-mile overland journey to be exchanged for teas and silks, principally the former. The Chinese prized this fur very highly and they were the first to discover the art of dyeing it.

Three years after the cession of Alaska, the Alaska Commercial Company obtained a twenty-year lease of the Pribilof islands, the consideration being an annual rental of \$55,000 and besides a revenue tax of two dollars on every skin taken. The maximum number of seal skins allowed to be shipped was 100,000 per annum. As the original cost or purchase price of Alaska was \$7,200,000, it is seen that the United States had almost from the beginning an income from these two small islands alone of nearly four per cent. on their investment for the whole territory.

A few words about the seal itself. Professor Elliott, of the Smithsonian Institution, spent several years on the dismal Pribilof islands for the express purpose of thoroughly studying seal life in all its phases, and to him most of our accurate knowledge of seal life is due. As already stated the first seal-fur of commerce came from the South Sea, hence the name South Sea seal still obtains, although by far the greater number of skins now come from the Alaskan or North Pacific waters. Whether ever the Alaskan seals migrated from the South Sea, thereby crossing the equator is not known, neither was it certainly known where these animals spent the winter months till this was discovered in the course of the investigations of the British Bering Sea Commission in 1891, when it was ascertained that the greater part of this season was passed in the waters adjacent to British Columbia and Southern Alaska. Prof. Elliott says, "there are few, if any, creatures in the animal kingdom that can be said to exhibit a higher order of instinct, approaching even our intelligence" than the fur seal.

A male in its prime, say six or seven years old, will measure $6\frac{1}{2}$ to $7\frac{1}{4}$ feet from the tip of its nose to the end of its abbreviated, abortive tail, and will weigh at least 400 pounds. The female on the other hand is very much smaller, being from 4 to $4\frac{1}{2}$ feet long, and is only about one-sixth of the weight of the male, but is much more shapely in its proportions. The adult males are the first to arrive in the spring, between the 1st and 5th of May, on the seal grounds or rookeries on the Pribilof Islands. It may be remarked also here that after the adult males land, they never leave the island nor partake of any food whatsoever until they leave some months later in the fall to spend the winter

in more southern waters. When they arrive in spring, they are rolling in fat, and when they leave in the fall they are a bundle of skin and bones. As soon as they arrive on the breeding grounds, each one, according to his physical persuasive power, pre-empt's a certain area, and remains there, awaiting the arrival of his spouses, for the seal is polygamous. Many of these adult males or bulls exhibit wonderful strength and desperate courage. Prof. Elliott marked one veteran, "who had fought forty or fifty desperate battles and fought off his assailants, who coveted his position, every time. When the fighting season was over, the veteran was covered with scars and frightfully gashed; raw, festering and bloody, one eye gouged out, but lording it bravely over his harem of fifteen or twenty females, who were all huddled together on the same spot of his first location and around him." Between the 12th and 14th of June the first of the cow seals arrive at the islands. The arrival of the cows is co-incident with the ending of the period of gestation, for one or two days after arrival the pup is born. The young are nourished by the mother, who frequently goes out to the sea to feed and bathe. The pups do not essay to swim, which they must first learn, like any boy, until they are a month or more old. The head and eyes of the female are exceedingly beautiful; the large, lustrous, blue-black eyes are humid and soft, with tenderest expression. The covering to the body of the fur-seal is composed of two coats, one having a short, crisp, glistening over-hair; and the other a close, soft, elastic pelage or fur, which gives the distinctive value to the pelt. When the skin reaches the furrier the hair has been removed and the pelage dyed.

Two-thirds of all the males which are born, and they are equal in number to the females, are never permitted by the remaining third, strongest by natural selection, to land upon the breeding ground, but this great 1 of "bachelor" seals, as they are aptly termed, is obliged to live apart entirely, sometimes miles away from the rookeries. In this admirably perfect method of nature are these seals, which can be properly killed without injury to the rookeries, selected and held aside, so that they can be taken without disturbing in the slightest degree the entire quiet of the breeding grounds where the stock is perpetuated. Such was, according to Prof. Elliott, the state of the rookeries in 1872-74, but

when he revisited the islands in 1890 he found that a great change had occurred. The "bachelors" no longer lay out in areas distinct from the breeding grounds, but in reduced numbers sought the protection afforded by the vicinity of the breeding grounds, so that it was no longer possible to drive the non-breeding seals without disturbance to the breeding rookeries. This great change he attributes to over-driving and over-killing of seals upon the islands and to the operations of pelagic sealers, acting concurrently. The relative importance of these causes of undoubted decline in numbers, on the Pribilof islands at least, have been earnestly discussed in connection with the Bering Sea arbitration.

When driven inland for a short distance by the natives, the seals find themselves upon the killing grounds.

Care must be taken not to urge them above half a mile an hour for overheating of the seal is very detrimental to the fur. The fur is thickest and finest in texture during the third and fourth year of life. Having arrived at the slaughtering grounds, and after the seals have cooled off, the killing begins. A hundred to a hundred and fifty are separated from the herd and on a given signal the natives, armed with oaken bludgeons five to six feet long, rapidly club and kill the unfortunate animals. They are then immediately bled and skinned. The whole work is performed in a remarkably short time. The average time taken to skin a seal is only four minutes, while the best men can do it even in a minute and a half. The skins are taken from the field to the salt house, where salt is profusely spread on the flesh-side, and they are piled up in the "kenches" or bins. After two or three weeks they become pickled and ready for shipment. Most of the skins go to London, England, for dressing and dyeing. The number of seals, male, female and young, annually visiting these islands has, from careful estimates, been found to exceed four millions.

By the middle of September the rookeries are all broken up; by the end of October, or the beginning of November all the fur-seals of mature age have left the islands. During August they shed their coats.

As practically only prime skins are taken at the islands, the great variation in seal-skin sacques is due mostly to the quality of work whereby the fur was treated and prepared for wear. A properly dyed skin,

one that has been conscientiously and laboriously finished,—for it is a labour requiring great patience and skill,—will not rub off nor “crock” the whitest linen when moistened; and it will wear the weather for six or seven seasons without showing the least bit of dimness or raggedness. The unhairing, in which the over-hair is deftly combed out and off from the skin, is done by heating the skin to a certain point so that the roots of the fur are not loosened, while those of the coarser hirsute growth are. If this is not done with perfect uniformity, the fur will never lie smooth, no matter how skilfully dyed; it will always have a rumpled, ruffled look. In dyeing, the liquid dye is put on with a brush and the skins hung up and dried. The dry dye is then removed, and so on until eight to twelve coats have been applied to produce a good colour. The skins are then washed clean, the fur dried, while the pelt is moist.

The fur-seal is a voracious eater. Its food is fish to the practical exclusion of all other diet. Cod, herring and salmon must lay tribute to its insatiable appetite, and the great North Pacific, 5,000 miles across, between Japan and the Strait of Fuca is its fishing pond. A low estimate of the annual consumption of fish by seals visiting the Pribilof islands, gives the enormous quantity of six million tons. As Prof. Elliott says: “The fishing of man, both aboriginal and civilized, in the past, present, and prospective, has never been, is not, nor will it be, more than a drop in the bucket contrasted with the piscatorial labour of these ichthyophagi in those waters adjacent to their birth.”

The most valuable of all furs is that of the sea-otter, which, however, is becoming year by year scarcer. Its haunts formerly extended along the whole coast of Alaska and further south, but the animal is now seldom met with. A prime skin is worth upwards of \$300.

Of land furs may be mentioned the land-otter, the brown and black bears, the beaver, the red, the black, the silver and the Arctic fox, and the mink and martin. The red fox is the most widely distributed fur bearing animal in Alaska. In south-eastern Alaska the principal fur obtained is the black bear. For hunting, the Indians are provided with rifles, and they have generally a very exalted idea of the value of their game. It is not an uncommon thing for an Indian, after not receiving the price demanded at Juneau, to start off with his canoe for Port

Simpson, or even for Seattle,—one thousand miles distant on the ocean,—to sell his skins. An Indian whom I know, went in his canoe last year to Seattle and there sold his bear skins, some forty odd, and returned with \$1,400 in cash. Of the Indian character I will speak further on.

Next in value to the fur trade of Alaska stands the salmon industry, which has been developed to an astonishing degree during the last decade.

The annual pack now is about 700,000 cases—nearly \$3,000,000 in value. Nearly the half of the output comes from the Karluk River on Kadiak island. This stream is not over fifty feet wide and not long, yet a dozen canneries draw their supply therefrom. Some years the run of salmon is much greater than usual. During the past season salmon were very plentiful. About the beginning of June they commence coming in from the ocean to ascend the streams for spawning. As the summer advances their number increases; up every river and stream, rivulet and rill, instinct drives them to fulfil their mission. Many succeed, but hundreds of thousands, nay millions, perish miserably at the mouths of torrential streams or cascades, attracted thither by the fresh water. They are pursued and attacked by the dog-fish, a species of shark, and one often sees salmon swimming about with pieces bitten out of their sides; and again towards fall thousands are found blind, hopelessly swimming about the mouth of their goal. It is a pitiful sight. Their race is run. High tide piles them on the beach to rot. For miles the air becomes offensive beyond endurance, and more than once was I obliged to change our proposed anchorage on account of the shoals of dead salmon. In south-eastern Alaska all salmon are packed by Chinese who are imported for the season from Portland or San Francisco.

Next to the salmon the codfish stands foremost in quantity as well as in commercial importance. However, as the demand is limited, the development of the cod-fisheries is very limited, the annual catch being only about \$40,000. The fish next in importance is the halibut, which is found in great numbers in favoured localities in south-eastern Alaska. It and the salmon form the great staple for consumption by the natives.

There is very little halibut exported. We caught, one day, with two hooks and in less than an hour, over half a ton of halibut. It is a delicious article of food and its most toothsome part is the dorsal fin.

To the Indians the Oolachan or candle fish is of considerable importance. It is a small fish and very oily, in fact so oily, that when dry it will burn like a taper or candle, hence the name candle-fish. The oil obtained from it is used by the coast Indians as an article of trade with the interior Indians, who are very fond of it.

Numerous whales may always be seen sporting and spouting in Frederick Sound, but are unmolested by natives and whites.

The Killer Whale (*Orca ater*) is frequently seen too, and it is a sight to see a huge whale when pursued rise vertically out of the water forty feet and then strike with terrific force, splashing the water with volcanic effect.

Immense shoals of herrings visit some of the bays. However, there is only one establishment—Killisnoo—where herring are caught for commercial purposes. All the herring caught there are converted into oil, and the residue is pressed, roasted and ground and sent to the sugar plantations on the Sandwich Islands as a fertilizer. At Killisnoo, the wharf, the walks and the factory are ever wet and saturated with fish oil, and the newcomer is very apt to perform some involuntary acrobatic feats. The Indians are very fond of herring spawn. To obtain it small branches of evergreen are placed in the sea at low tide, and with the rising tide the branches become thickly covered with roe. The twigs then look as if they had been sugared. The Indians eat it right from the branches.

Next in importance to the fisheries is the mining industry. However, when one examines the cold facts about mining in Alaska, the result is not very cheering. Leaving out the Treadwell mine, on Douglas island, near Juneau, it is safe to say that more value in labour has been expended in obtaining gold than all the gold that has been sent out of Alaska, be it from placer or quartz mining, is worth.

The Treadwell mine yields a very low grade ore, but it is very easily mined or quarried, being an open mine, and there is almost an inexhaustible quantity of ore there. The company has a 240 stamp mill for

crushing the ore, and chlorination works for extracting by chemical process the finely disseminated ore. The fumes from the chlorination works have killed the surrounding forest over a large area.

The annual output from this mine is about \$800,000, of which a little over half is profit.

On several mines back of Juneau, in the Silver Bow Basin, several hundred thousand dollars have been expended in extensive hydraulic mining, but so far the net results have not been very remunerative. Prospectors' holes, and small tunnels, are quite numerous along the coast. Each in turn had its day of showing the "best indications" and then dropped out of sight.

Mining, or rather prospecting, is undoubtedly an alluring vocation. The prospector lives and starves on hope, striking it rich some day; yet, how very small is the probability of his success and how great the sacrifice he makes.

The discovery of rich gold and silver mines or diggings is not an unmixed good. The value of these mineral finds, although sometimes very rich, is generally ephemeral. The result is an abnormal prosperity of one or more towns or cities whose birth is due to the gold or silver discovery. Railroads are built, business, bustle and activity are rampant in the mining region. After a few short years, the scene changes, mines or diggings are exhausted, there is a stampede out of the district almost as vehement as there was into it. Real estate, houses, blocks, everything immovable becomes unsaleable. Many of the people of the mining region have been ruined through its shortlived prosperity. A glaring example of these conditions is the state of Nevada, which some years ago was struck by a rich mineral wave, on the crest of which Nevada was enabled to ride into full sisterhood in the Union. To-day it lies prostrate, and her whole population, spread over an area of 110,000 square miles, is less than that of the city of Ottawa. In the same relation I might mention the Fraser River and Cariboo gold diggings in the sixties. Where are to-day the signs of prosperity of those golden footsteps of years gone by? What I wish to impress is, that a country that is solely or mainly dependent on gold or silver production is a factor in unstable equilibrium. Gold and silver mining is not conducive to the permanent

settlement of a country. The great gainers by such mining regions are the outside centres of supply, whose creation is not due to the discovery of minerals, and whose permanence is dependent on other sources of business.

A far more valuable mineral than gold or silver, is coal. Although coal has been found at several points in Alaska, yet up to the present it has not been mined for commercial purposes. That country has the greatest stability whose principal resources are food, hence the ultimate and inevitable success of Manitoba and the North-west.

To sum up, the mineral resources of Alaska thus far developed are gold mines, and of these the Treadwell mine produces nearly the whole annual yield.

We now come to the last of the natural resources of Alaska, viz : timber. The public is apt to associate with the word Alaska a cold, barren, rocky country. But such is not the case, especially not in south-eastern Alaska, where, on account of the mild temperature and copious rains, a luxuriant vegetation is seen on the strip bordering the sea. Heavy carpets and festoons of beautiful mosses, luxuriant ferns and dense undergrowth, characterize the coast region. The whole area is densely wooded. The timber line is found at an elevation of about 2,500 feet. Spruce and hemlock are the predominant varieties of wood ; red and yellow cedar are also found, but in limited quantities. On deltas and sea level terminal moraines, the poplar and cottonwood are found. The alder flourishes on old moraines and on snow slides, and the crab apple is sparingly scattered through the forest.

Although the country is densely wooded, yet the timber at for the mill is very limited, and hence no very great value attaches to it. For some, not very apparent, reason, the United States government prohibits the manufacture of lumber in Alaska for export, even into the United States. There are a number of small saw-mills in the country, which supply the limited demand for building purposes and for the shooks used by the canneries for salmon cases or boxes. The spruce grows to a very respectable size. I have measured some logs over five feet in diameter ; however, the average is under three feet. Soil there is not much, and it is astonishing on how little the trees grow. How-

ever, the nourishment is apparently not equal to the demand, for after the trees have attained a certain height the tops die, and looking over the forest from the sea it presents the appearance of hop poles.

The lumbering is all done on the immediate coast, and the logs rolled or skidded into the sea, and then boomed and drawn by tugs to the mill.

The population of Alaska by the last census, that of 1890, gives a total of 32,000, of whom 4,300 are whites, 23,500 Indians and 2,400 Mongolians and others. There are less than 500 white women in the whole country, at which fact I think a philanthropist would rejoice.

The natives of south-eastern Alaska, with whom we are immediately concerned, belong nearly all to the great Thlinket tribe.

Everywhere in nature science is gathering facts. Facts are correlated, and cause and effect studied. Under the term cause is included the term environment. Environment plays a great part in both the animal and vegetable kingdoms. It is the key that has unlocked many of the secrets of nature, and in skilful hands will further shed light on nature's work. Thus has environment exerted its influence on the Indians in moulding their habits, customs and character, and also, to some extent, their physical traits. The island home of the Haidas in the broad expanse of the Pacific has developed them into the highest type of Indians on the coast. The Thlinket have, in general, thick, coarse, straight, black hair, large fiery eyes, a small, flat, broad nose, and large cheek-bones. As much of their lives is spent in canoes, it has impaired their powers of locomotion, and misshaped their legs, rendering them decidedly awkward on shore. Their teeth are white, but in old age become worn down by eating dried salmon on which sand and grit have gathered in the process of drying. Many of the females, in their youth, are quite rosy and comely. In complexion both sexes are surprisingly light coloured, which is not due to any admixture with whites, although admixture is not uncommon. It is recorded that formerly they bathed frequently, both in summer and winter, and thereby hardened their physique; furthermore that the children were daily bathed in the ocean; this undoubtedly resulted in the survival of the fittest. From my observations, however, I think that

this habit has gone out of vogue, judging from the faces of many of the children and grown up people as well.

The greatest curse to the Indian has been alcohol, and against this temptation he seems absolutely unable to struggle. Small-pox has ravaged the coast terribly. Rheumatism and pulmonary diseases are their worst ills, while venereal diseases are extremely destructive.

Year by year it is becoming more difficult to study the Indian, as with the increase of travel and commerce, and consequent contact with whites, he is steadily losing his native characteristics and adopting instead our customs and habits. They are reserved and taciturn and show an utter indifference, in fact contempt, towards the whites when by chance they meet on a common camping ground. This latter characteristic is different from that of our North-West Indians, who are also taciturn, but very inquisitive to see what is to be seen. They are not as fond of display and parade as formerly; however, on the 4th of July, a day they anxiously look forward to, many of them are clothed with all the fineries, not Indian, but the best to be had in the stores. Last 4th of July I happened to be at Juneau, where hundreds of Indians had gathered to attend and take part in the festivities. To one accustomed to seeing concourses of Indians in the Northwest it was a sight to study. Many of the young Indian women were dressed in silk, or satin, or velvet; in white, red, blue, yellow or black; the hair "banged" and crowned by a nobby hat; the face powdered à la mode; the feet encased in buttoned kid boots, and perfume and jewelry galore. The older ones content themselves with wool or cotton fabrics; only one squaw did I see with the time-honoured blanket. The young men were similarly well dressed, wearing nice store clothes, silk-trimmed spring overcoats and watches, and smoking cigars. The whole illustrated what has been abundantly proved, and that is, that commerce is the great civilizer of native races.

Dancing and singing were formerly a part of their ceremonies of welcome, trade and war; but now the dancing is that of Americans and confined generally to festive gatherings. At the dance or ball given on the above day in the Juneau Opera House, the grace with which some of the Indian ladies waltzed was very marked. By nature the Indian

is rather indolent, but his ambition for wealth and its inherent mark of distinction makes him enterprising. They have considerable business judgment, and it is a rare occurrence that a white man gets the better of a bargain with an Indian of south-eastern Alaska. When first visited by the early voyagers, these Indians, like all others on the coast, were bold, arrant thieves; to-day, however, this accusation cannot be made against them. They have great respect for the aged; between the sexes the rights of the women are regarded, and they live on terms of equality. They have considerable artistic taste in the use of colours, are advanced in the arts of carving in wood, slate and metal, and have fair abilities in drawing and designing. In the latter I found a marked characteristic, and that is, the absence, or scarcity at least, of curves in their designs, they being nearly all angular and rectangular.

The totem poles one finds in the villages throughout south-eastern Alaska are relics of the past. They are carved tree trunks, upwards of thirty feet high, with grotesque figures which, in a measure, represent a genealogical tree. A totem is simply an organization of consanguineal kindred into a recognized group or band. The organization is based on mother-right, (such as rank, wealth, property etc.) received from the mother. The most prominent totems met with are the wolf, raven, eagle, bear and whale.

The practice of mutilation is older than recorded history. Man never has been satisfied with either his structure or appearance, and has constantly endeavored to improve upon both. However, at present little mutilation is done. Occasionally one meets a woman with a pierced under lip, a projecting plug being inserted into the hole; and also women with tattooed arms and hands. The most hideous practice still in vogue among the women is that of painting the face black, leaving a large circle around the eyes unpainted, thereby making the face most repulsive. The paint consists of fish-oil and charcoal, and acts as a preventive against mosquitoes. Another use is for improving the complexion, and for this purpose it is efficient. I recollect seeing a squaw going off with a blackened face for some weeks on a hunting tour with her husband; after they returned, she washed herself and emerged like a butterfly from the chrysalis, clean, fair and bright.

The canoe is to the North-west coast what the camel is to the desert. It is to the Indian of this region, what the horse is to the Arab. It is the apple of his eye and the object of his solicitous attention and affection. The canoes are hewn out of one solid cedar trunk, and are now seldom made over 30 feet long, although formerly they were made over twice that length and carried several tons. Every year finds the Indians more and more abandoning their old form of one-room houses, earth floor and central fireplace, and adopting our manner of building. In short, the Indian is day by day becoming more of a white man. He is still fond of dogs, ad infinitum one might say, especially when one hears the apparently preconcerted simultaneous howl of the colony. Their food, they mostly find on the tide flats, where the Indian table, too, is set twice a day. The advance of civilization has not robbed the Alaskan Indian of his means of sustenance, as the disappearance of the buffalo has our North-west Indian. Commerce and civilization can never rob the Alaskan Indian of his food. Sepulture as now practiced is mostly by inhumation-at-length. They also buy cheap paper-covered trunks into which the corpse is packed and placed in a small enclosure or house, over which float streamers or flags to ward off the evil spirits. Cremation and aerial deposition are not practiced now. The shamans, or medicine-men, witch-craft, and slavery received their quietus after the United States came into possession of Alaska. Similar it is with the potlach, or grand party as we would call it, which served as in modern society to a great extent to give a social standing. The Indian often gives potlaches beyond his legitimate means; he probably anticipated the white man. At the ceremony of an Indian house-warming at Wrangell it cost the host \$5,000 in blankets and other presents.

In conclusion I will speak briefly of the Survey being made in Alaska by our Government.

The definition, by treaty in 1825, of the boundary line of Alaska was the outcome of, and a side issue in the protest of Great Britain against the unwarranted assumption by Russia of exclusive jurisdiction in Behring Sea. The British position was at the time tersely stated by the significant words—"We negotiate about territory to cover the remonstrance upon principle."

The treaty made the boundary in south-eastern Alaska run along the summit of the mountains situated parallel to the coast, but in no case to extend farther inland than ten marine leagues. Although at the time of the treaty, Vancouver's and other charts existed, showing accurately the shore line and islands, yet of the true topography of the country itself little was known ; in fact, our survey is the first attempt to determine the topography on which by the terms of the treaty the position of the boundary line depends ; hence it will be seen and understood that the joint survey now being made is not to define the boundary line, but to get the topography of the country adjacent to the coast, so that, thereafter, intelligent discussion can take place and ultimate delimitation on the ground be effected.

The system of photo-topography, which was developed by the Surveyor-General, Captain Deville, and so successfully applied in our Rocky Mountains, was adopted by the Canadian Boundary Commission for its work in Alaska, where, on account of the intensely mountainous character of the country it was especially applicable. It may be mentioned with pride that the officers of the United States government who were in the field with us, acknowledged our method far superior to theirs, in fact said that our method was the only practicable one in such a tumultuous region.

Armed with a specially constructed camera and small transit instrument, the surveyor with his assistants climbs the mountain peaks and there makes angular measurements, and takes photographs of the surrounding country within a radius of at least ten miles. It is scarcely necessary to say that his work is intensely laborious, and often dangerous to life ; breaking his way through jungles of dense undergrowth in the primeval forest, fighting that poisonous shrub, the devil's club ; crawling up and around precipices, crossing treacherous glaciers with yawning crevasses and chasms ; standing with wet clothes on a pinnacle in a howling wind and at times in a snow storm : such are a few of the trials and tribulations of the photo-topographer ; but he is happy as long as he gets good views ! However, when, time and again, he has to ascend thousands of feet the same mountain only to find himself enveloped in a fog or clouds at the summit, then !—well, he climbs again.

The alpenstock is an indispensable adjunct for climbing. Inexperienced men invariably consider a gun or rifle very desirable in climbing, "to shoot a bear, don't you know." Suffice it to say, no bears were shot while mountain climbing. The picture presented to one, on one of the summits, is well described by a recent writer thus :

"What a scene of desolation

I saw from the mountain peak,

Crags, snowfields, glaciation

Unutterable to speak."

Scarcely a vestige of verdure is in sight, arctic are the surroundings. What grand upheavals of nature come under the topographer's gaze! Dozens, nay, hundreds of ice-bound and mountain-hemmed lakes come under his view and tell of receding glaciers. He traces from the névé and melting glacier, rills to creeks, creeks to streams, and streams to rivers, until they enter whence they came, the ocean.

Camping along the Ottawa is considered sport and healthy outdoor exercise; in Alaska with the incessant rains, it is considerably the reverse. Clothes, boots, provisions, everything gets mouldy in camp. The precipitous nature of the shores makes good camping ground very scarce, and an undue regard for the high or spring tides caused some rude awakenings at night, to find oneself unceremoniously a dweller in the Pacific or living in Venice. Nearly all the ascents were made directly from the sea-shore.

The highest mountain climbed was within a few feet of 7,000 feet above the sea. The experienced climber covers about a thousand feet an hour. The descent, when over snow fields, is sometimes made at a dangerous velocity, by squatting down and tobogganing, using the alpenstock for steering. This method is rather risky, for an unseen precipice may some day be the cause of an untimely end to the topographer's career.

Several hot springs were encountered on the work. I took the temperature of a sulphurous one near the coast, and found it to register 164° F., a temperature sufficient to boil eggs. Hot springs and glaciers,—a peculiar combination!

On account of the continued saturated condition of the atmosphere

great care must be exercised with photographic plates, for which reason they are kept in tin boxes, water and air-tight.

During the past season about seven hundred photo-topographic plates were obtained, covering an area of nearly five thousand square miles ; besides nearly a hundred 8 x 10 plates, making a collection of photographs showing glaciers, glaciation, and glacial action of the greatest interest and value.

I will dwell for a moment upon climate, with special reference to an ice age or glacial period. The absolute amount of heat received annually from the sun is not known, nor the fluctuations in the emanations from the sun, nor his rate of cooling ; all of which affect both the meteorological and climatic conditions upon the earth. However, certain it is, that astronomical conditions, periodic in their function, must produce some effect on climate. Climate, and its offspring, meteorology, are complex subjects. They are the effects or phenomena of various causes interlinked and interwoven to such a degree that up to the present time their true history has not been written. We know that summer and winter are due to the obliquity of the axis of the earth to the plane of its orbit. By summer we understand the time from the vernal to the autumnal equinox, and winter from the autumnal to the vernal. The proportion of heat received in summer is to that received in winter as 63 is to 37 ; and this is practically constant for all time ; for the obliquity changes but very little.

If there were no other changes in the relative position of the earth towards the sun, there would be no change of climate further than that indicated above ; but, as a matter of fact, the earth, revolving in an elliptic orbit around the sun, does not preserve the same orbit through all times, that is, the eccentricity changes. Furthermore the line of equinoxes passes around the ecliptic, and this, combined with the change of eccentricity of the earth's orbit, produces a change in the climate by changing the lengths of summer and winter.

For instance, at present our summers are seven days longer than our winters, there being 186 days between the vernal and autumnal equinoxes, and 179 between the autumnal and the vernal. The time required for the line of equinoxes to make a complete revolution is, in

round numbers, 21,000 years; so that in 10,500 years (one half of that time) the conditions will be reversed; that is, we shall have a winter of 186 days, and a summer of 179 days. Then we shall have for winter the 37 per cent. of the annual heat spread over 186 days, whereas now it is spread over only 179; and there must be, in consequence, a lowering of temperature, which, when counted from absolute zero or the temperature of intersellar space, must be quite an appreciable quantity, and one not to be neglected. The maximum difference there can be between winter and summer is about 25 days, and this occurs when the orbit of the earth has its greatest eccentricity, and the line of the equinoxes is perpendicular to the major axis of the earth's orbit; we have then the maximum astronomic cause for glaciation.

Another important point which must be taken into consideration is this, that the total amount of heat received upon a hemisphere at any time, and in any geologic age, is practically constant, or nearly so.

Now, as the total annual heat is constant, and the ratio of heat received in summer and winter is also constant, but the lengths of winter and summer vary, therefore the average amount of daily heat received in winter and summer during different years varies. This gives us a clue for one of the causes for an ice age.

The condition favourable for glaciation is, naturally, one where the winter is longer than the summer, and whenever that condition obtains in one hemisphere of course the reverse obtains in the opposite one. We can safely say, therefore, that 10,500 years ago the northern hemisphere, if not glaciated, was at all events, disposed towards glaciation, and very likely, in part, was glaciated. From astronomic reasoning, there would be a succession of periods tending towards glaciation, the effect of which other causes may mitigate, or even obliterate, or on the other hand, intensify.

The distribution of land and water, atmospheric and oceanic currents, of course, exert a powerful influence on the conditions brought about through astronomic causes. The preponderance of land in the northern hemisphere may possibly be due to the fact that during the critical time of crust-forming that hemisphere had its winters for thousands of years in aphelion.

It is not my intention to go further into the question of ice ages, but I simply wish to show that the question of ice ages or glacial epochs is one which properly falls also within the sphere of mathematicians and astronomers, and is not one wholly belonging to the realm of the geologist.

(Mr. Klotz then showed, with the aid of a lime-light, 28 typical views of Alaska, taken in connection with the Boundary Survey. Numerous dead and living glaciers were thrown on the screen, showing lateral, median and terminal moraines; also the erosive and grinding action of glaciers. The principal features of each view were lucidly explained.)

The largest glacier in Europe is the Aletsch, which measures about fourteen miles from its névé to its foot. The celebrated Mer de Glace, which descends from Mont Blanc to the valley of Chamounix, is about eight miles long below the névé-field. On our survey the névé of the Foster Glacier was found to extend into the interior thirty miles, and this is by no means the largest one. The glaciers of the Alps are mostly confined to the northern side of the mountains and none of them descend below 4,000 feet.

A feature of a once glaciated area, is the numerous lakes that are left after the recession of the glaciers; partly in basins that have been scooped out, and partly in basins that have been formed by damming of the valley by moraines. Those of the latter kind become relatively soon drained by the erosion of the barrier. In Tyrol, during the past century, no less than one hundred and eighteen lakes have disappeared, as found by comparison of maps covering that period.

Knowing the origin, then, of many lakes in northern latitudes we are not surprised at the innumerable lakes that dot Canada from Halifax to the Mackenzie.

Norway presents a similar picture.

REFERENCES

"The Seal Islands of Alaska," H. W. Elliott.

"The Coast Indians of Southern Alaska and Northern British Columbia," by A. P. Niblack.

Eleventh Census, 1890, U.S.

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